

If n is odd
Figure 1-2i

- **Inverse variation function**, Figure 1-2i
(a special case of a power function)

General equation: $f(x) = \frac{a}{x}$ (or $f(x) = ax^{-1}$)

$$\text{or } f(x) = \frac{a}{x^n} \text{ (or } f(x) = ax^{-n}), a \neq 0, n > 0$$

Verbally: $f(x)$ varies inversely with x (or with the n th power of x). Alternatively, $f(x)$ is inversely proportional to x (or to the n th power of x).

Features: Both of the axes are asymptotes. The domain depends on the value of n . For positive integer values of n , the domain is $x \neq 0$. For most real-world applications, the domain is $x > 0$.

What if n is even?
For example, $y = \frac{1}{x^2}$

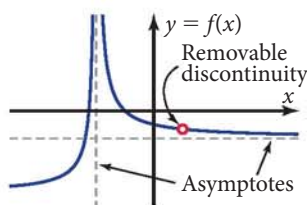
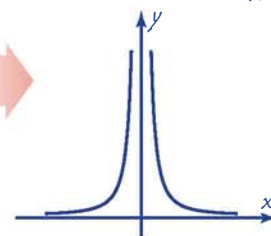


Figure 1-2j

- **Rational algebraic function**, Figure 1-2j

General equation: $f(x) = \frac{n(x)}{d(x)}$, where n and d are polynomial functions

Verbally: $f(x)$ is a rational function of x .

Features: A rational function has a discontinuity (asymptote or missing point) where the denominator is zero; it may have horizontal or other asymptotes.

Restricted Domains and Boolean Variables

Suppose that you want to plot a graph using only part of your grapher's window. For instance, let the height of a growing child between ages 3 and 10 be given by $y = 3x + 26$, where x is age in years and y is height in inches. The domain here is $3 \leq x \leq 10$.

Some graphers allow you to enter a restricted domain directly. Other graphers require you to use **Boolean variables**. A Boolean variable, named for George Boole, an Irish logician and mathematician (1815–1864), equals 1 if a given condition is true and 0 if that condition is false. For instance, the compound statement

$$(x \geq 3 \text{ and } x \leq 10)$$

equals 1 if $x = 7$ (which is between 3 and 10) and equals 0 if $x = 2$ or $x = 15$ (neither of which is between 3 and 10). To plot a graph in a restricted domain using Boolean variables, divide any term of the equation by the appropriate Boolean variable. For the equation above, enter

$$f_1(x) = 3x + 26 / (x \geq 3 \text{ and } x \leq 10)$$

If x is between 3 and 10, inclusive, the 26 in $3x + 26$ is divided by 1, which leaves it unchanged. If x is not between 3 and 10, inclusive, the 26 in $3x + 26$ is divided by 0 and the grapher plots nothing.